

Definition, Convention, and Simultaneity: Malament's Result and Its Alleged Refutation by Sarkar and Stachel

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Abstract

The question whether distant simultaneity (relativized to an inertial frame) has a factual or a conventional status in special relativity has long been disputed and remains in contention even today. At one point it appeared that Malament (1977) had settled the issue by proving that the only non-trivial equivalence relation definable from (temporally symmetric) causal connectability is the standard simultaneity relation. Recently, though, Sarkar and Stachel (1999) claim to have identified a suspect assumption in the proof by defining a non-standard simultaneity relation from causal connectability. I contend that their critique is based on a misunderstanding of the criteria for the definability of a relation, a misunderstanding that Malament's original treatment helped to foster. There are in fact a variety of notions of definability that can be brought to bear. They all, however, require a condition that suffices to secure Malament's result. The non-standard relation Sarkar and Stachel claim to be definable is not so definable, and, I argue, their proposal to modify the notion of "causal definability" is misguided. Finally, I address the relevance of Malament's result to the thesis of conventionalism.

Keywords: relativity, simultaneity, convention, conventionalism, conventionality, Einstein, Malament, Sarkar, Stachel, definability

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